

China's Mechanization Experience on Rice Harvesting, Processing, and Storage

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01

Technology Application History

Rice Harvesting — The Complete Manual Era



Manual cutting

Before 1995



Manual throwing and threshing



Manpower Winnower



Rice Harvesting — The Semi Mechanization Era

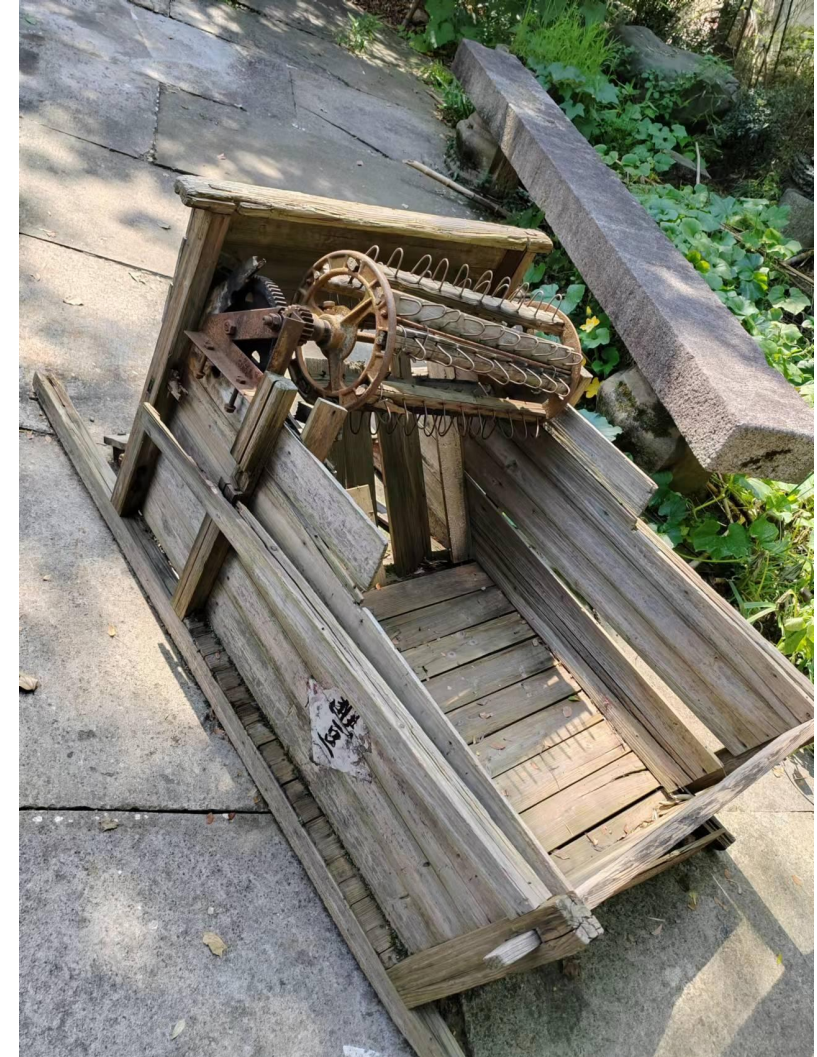


Handheld windrower cuts down rice and stacks it in an orderly manner



Backpack windrowers cut down rice and stack it in an orderly manner

Before 2000



The rice thresher commonly used in the 1990s



Rice Harvesting—The Combined Mechanized Harvesting Era

Combine harvester without driver's cab and grain bin



Before 2015

Combine harvester with grain storage but without cab



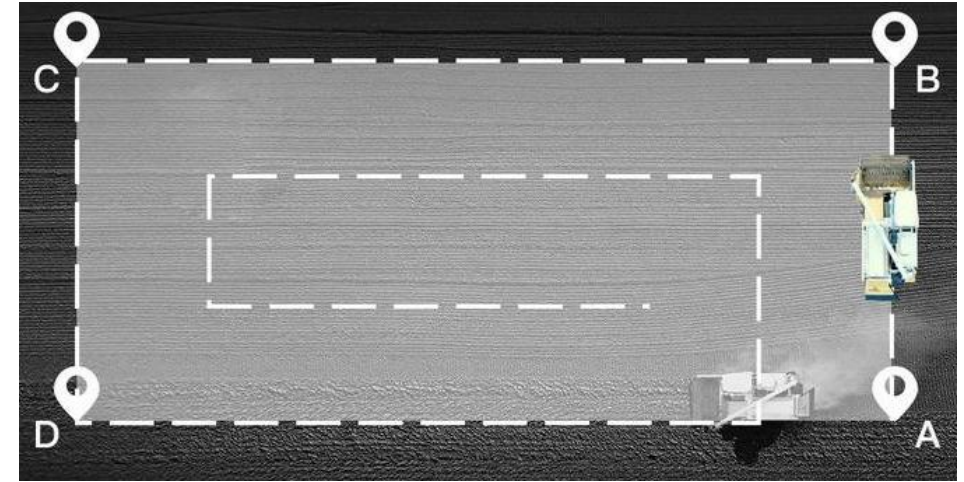
After 2016
Rice combine harvester with cab, air conditioning, and granary



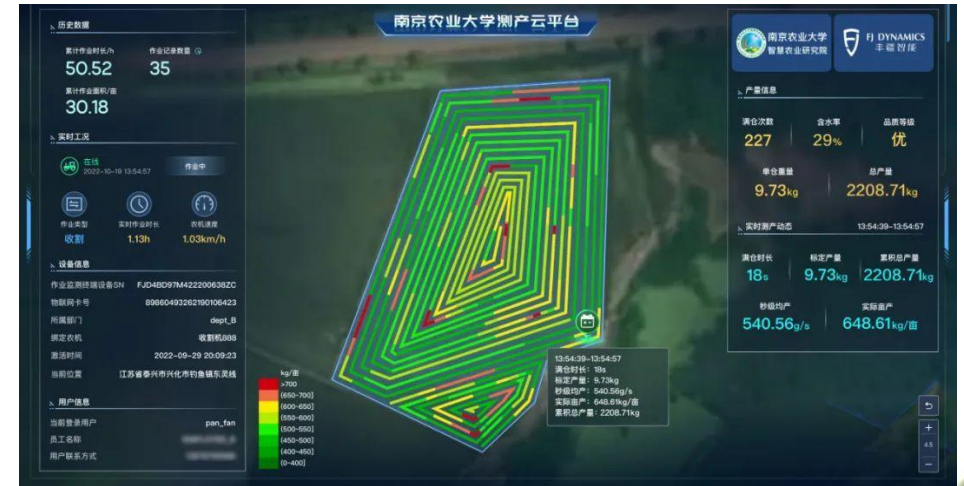
Rice Harvesting — The Intelligent Mechanization Harvest Era



Autonomous driving



Automatic route planning



Online real-time yield measurement

Rice Processing



Stone milling rice (*before 1960*)



Rural collective rice mills use machines to for rice milling (*1960-2000*)



Small Household Rice Mills (*After 2000*)



Rice Processing



Modern Rice Processing Factory

- ❑ removing stones
- ❑ hulling
- ❑ sieving
- ❑ milling
- ❑ polishing
- ❑ color selection
- ❑ cooling the rice

Full process automation (*now*)



Rice Drying and Storage



Farmers self dry and store (before 2010, most of the grain was stored by farmers)
Temperature and humidity are uncontrollable, and pests and mold can easily damage grain



Agricultural machinery cooperatives or national grain depots for drying and storage (after 2010, most of the grain is stored in national grain depots or grain warehouses of grain consuming enterprises)
Temperature and humidity can be controlled, and nitrogen can be filled to prevent pests and mold





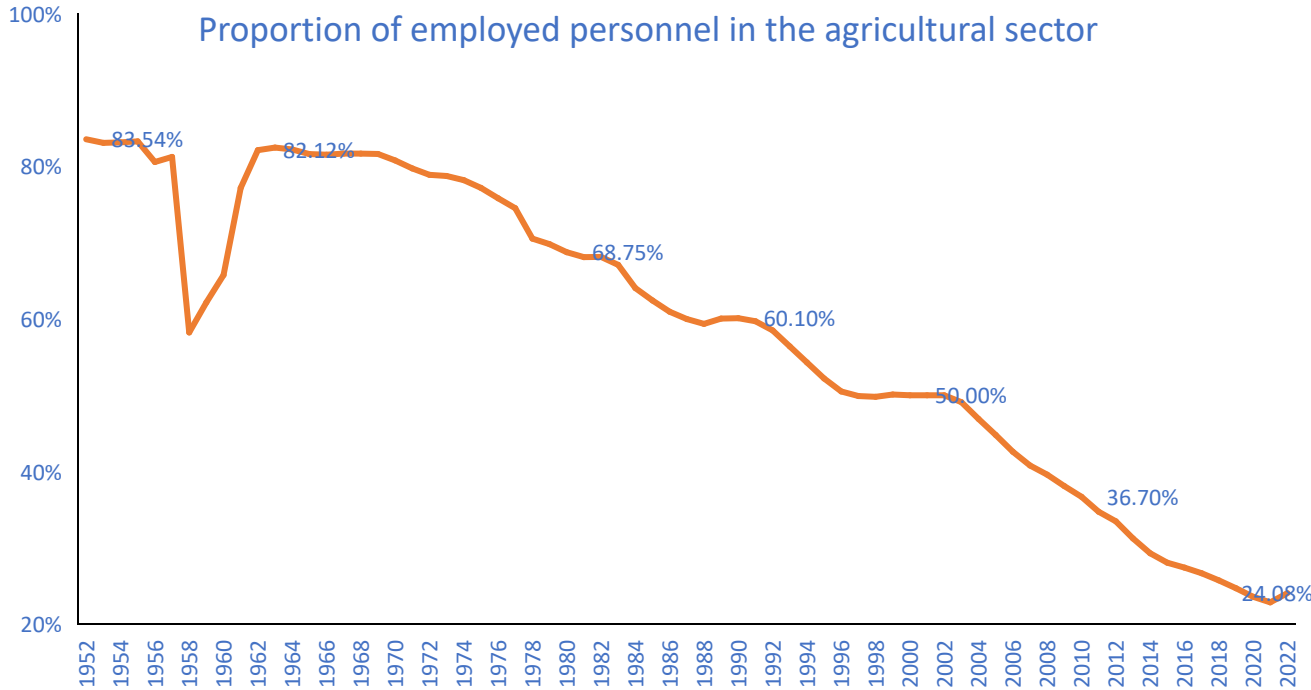
02

Contribution to the agricultural sector

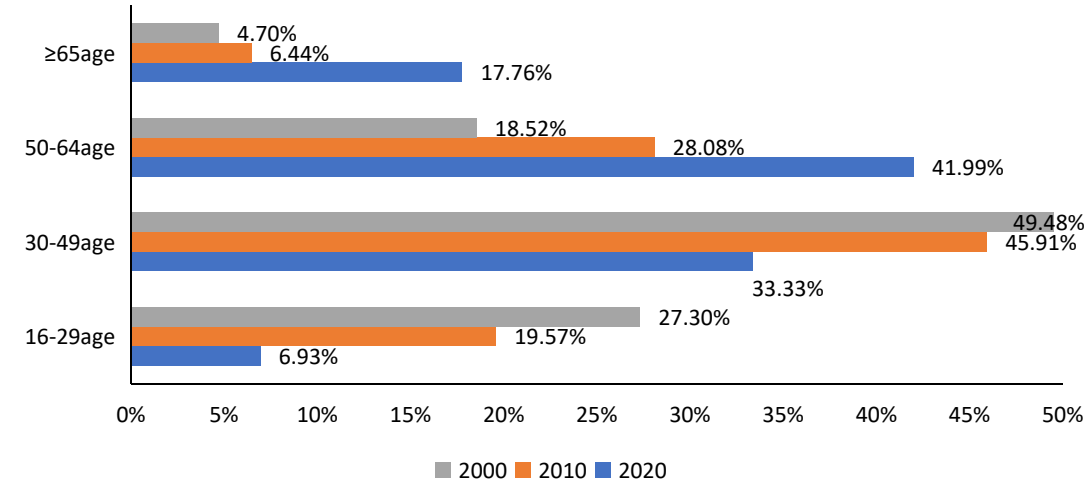


Nowadays, more and more people in China are leaving rural areas to find blue-collar or white-collar jobs in cities, resulting in significant changes in the number and age structure of agricultural labor force.



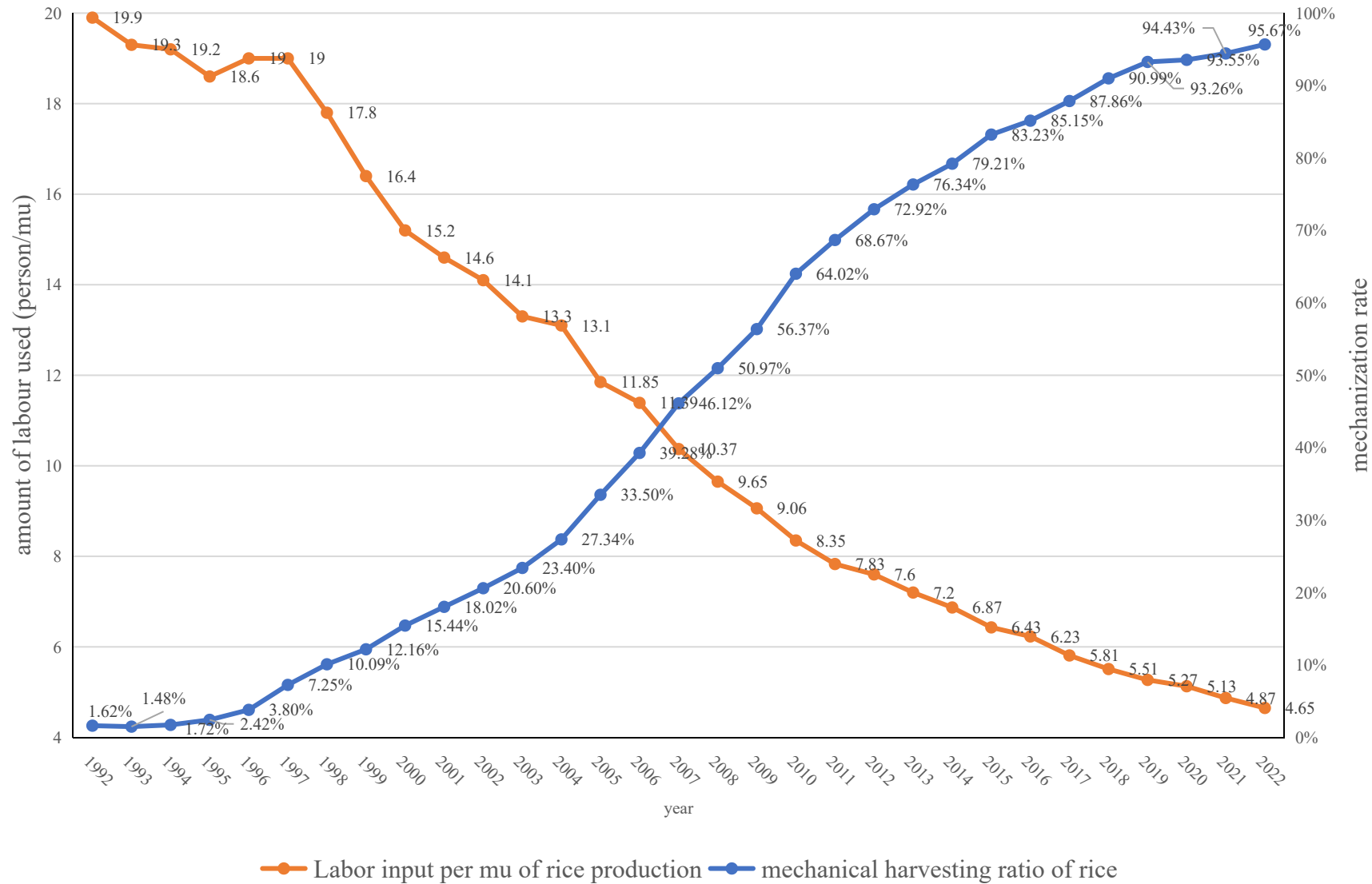


Age Structure of Agricultural Labor Force Based on Three Census Data



In the past 20 years, with economic development, the proportion of agricultural labor force in China's employed population has rapidly decreased, from 50% in 2000 to 24.08% in 2022. At the same time, the agricultural labor force has rapidly aged. At the same time, the agricultural labor force has rapidly aged. According to the 2000 national census data, the proportion of the 50-64 age group and the age group 65 and above is only 4.70% and 18.52%, respectively. However, the 2020 national census data shows that the proportion of agricultural labor force in these two age groups has reached 41.99% and 17.76%, respectively. In the context of rapid reduction and aging of agricultural labor force, in order to ensure food supply, it is required that the level of agricultural mechanization must be improved as soon as possible.

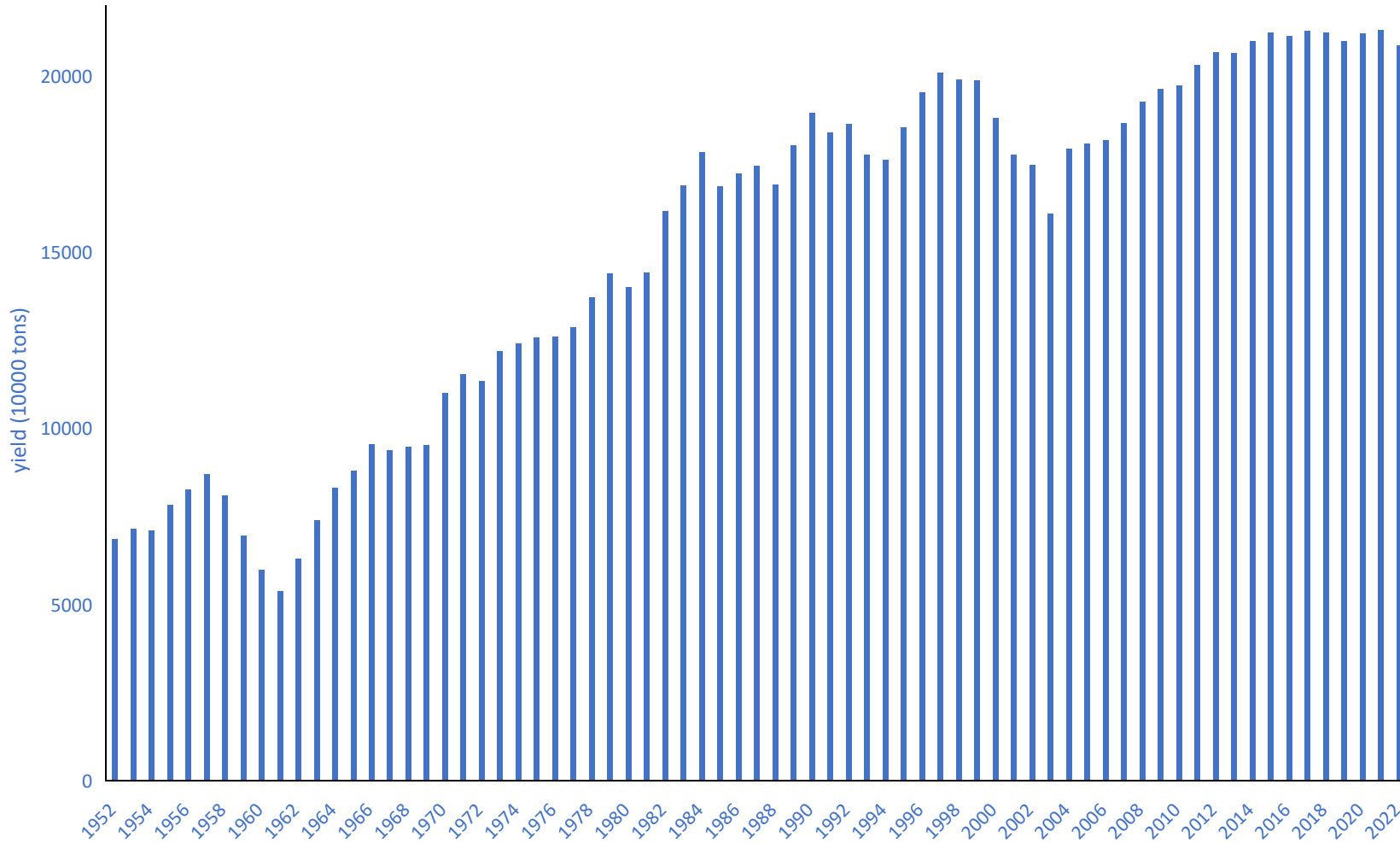




In 1992, the mechanization level of rice harvesting was only 1.62%, and by 2022, it had reached 95.67%. With the rapid improvement of the mechanization level of rice harvesting, the labor force in rice production has significantly decreased, with the labor force per mu of rice production decreasing from 19.9 to 4.87.



Rice yield



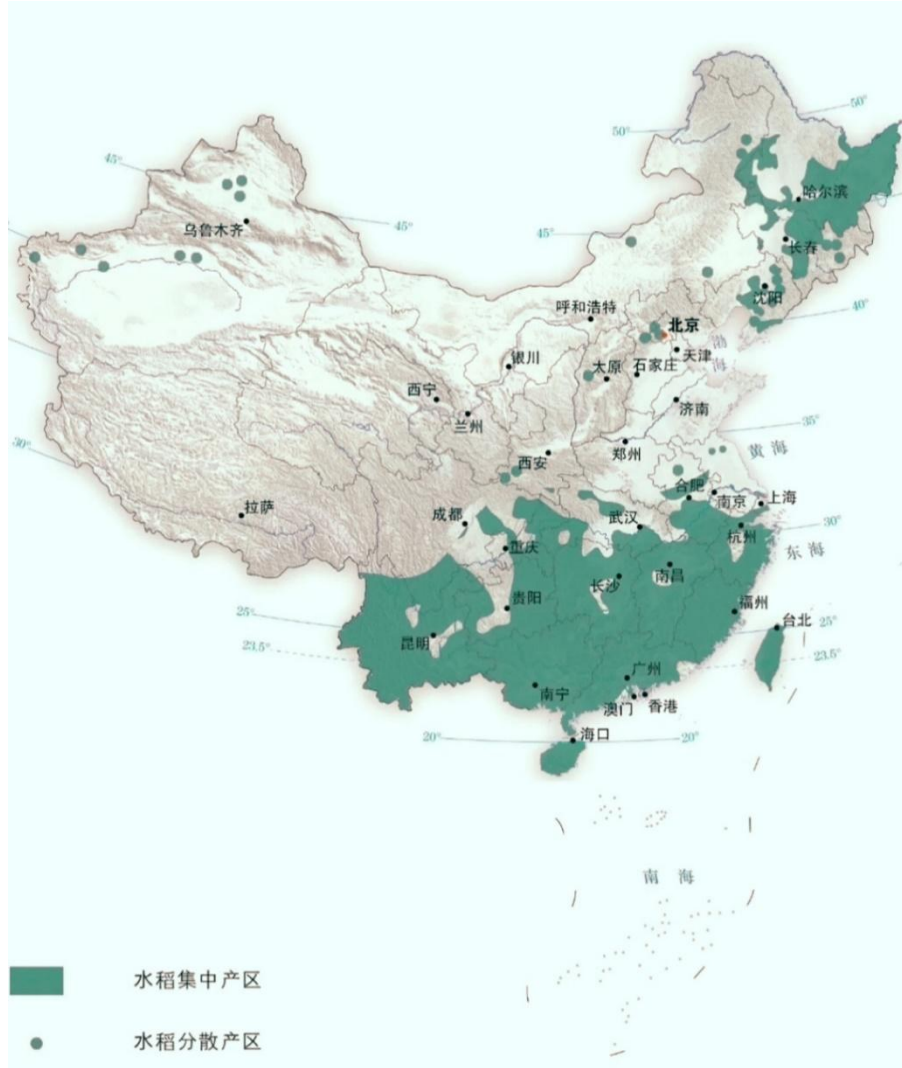
With the rapid reduction and aging of agricultural labor force, the rapid development of agricultural mechanization has ensured the national production of rice and other grains. The production of rice has not been affected, but on the contrary, the yield is showing an upward trend.





At the same time, the elderly and women who stay in rural areas can easily complete agricultural production work, greatly reducing their labor intensity, and no longer have to work hard like they used to, improving their sense of happiness in life.





03 Socialized Services Experience



The rise of cross regional operation of harvesters

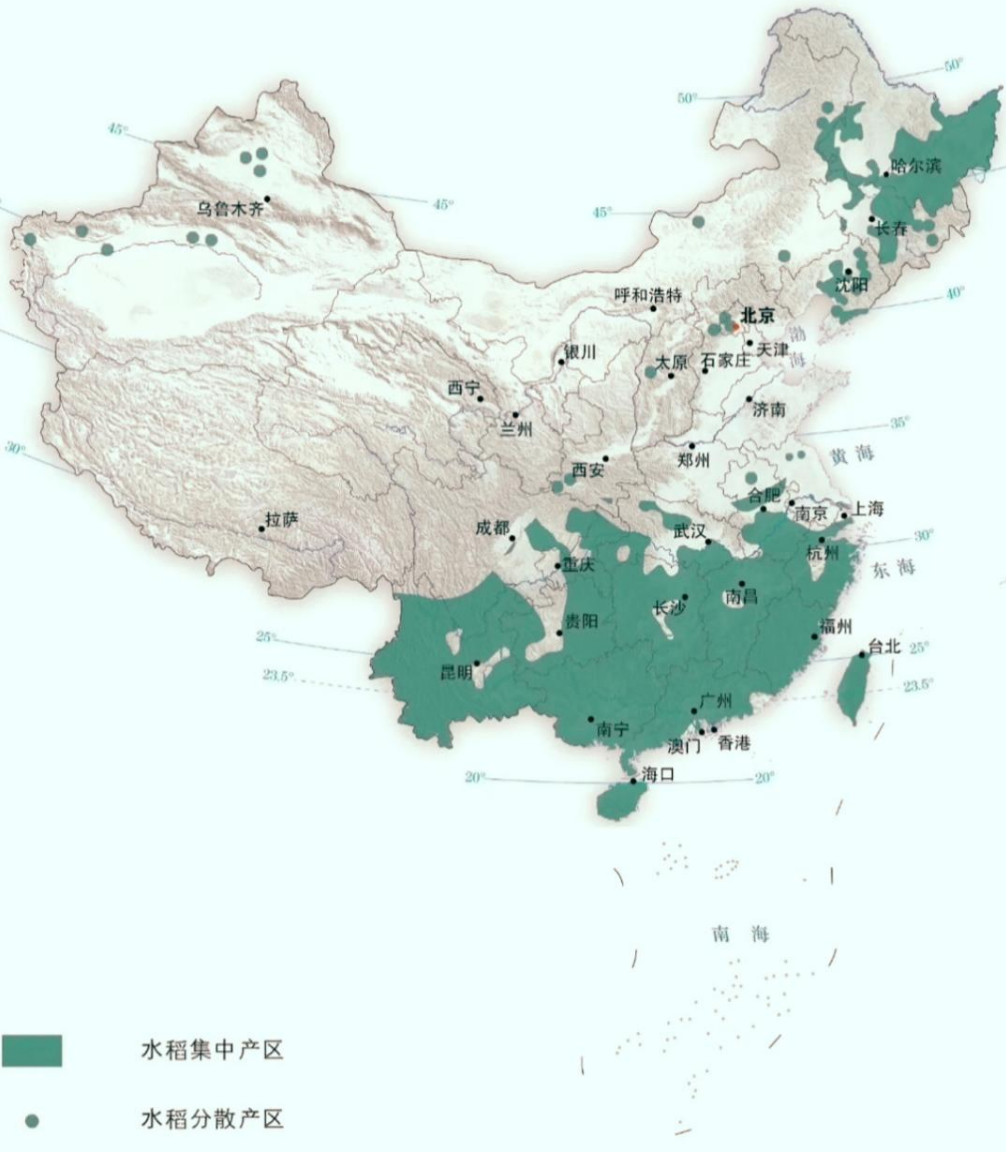


The average household arable land of Chinese farmers is less than 10 mu. If a farmer with a rice planting area of 10 mu relies on manual harvesting, it will take 20 days to complete. If he hires labor to harvest rice for 100 yuan per day, it will cost 2000 yuan. But if he buys a rice harvester worth 200000 yuan and only uses it for his own family, he can complete the harvesting of 10 mu of rice in one hour, but it will take 100 years to recover the cost.



However, if a farmer purchases a rice harvester worth 200000 yuan, He not only harvests for himself, but also for farmers in the surrounding areas and even across counties and provinces. If he harvests 4000 mu per year and charges 50 yuan per mu, he can recover the cost in one year and make a profit from the second year onwards.

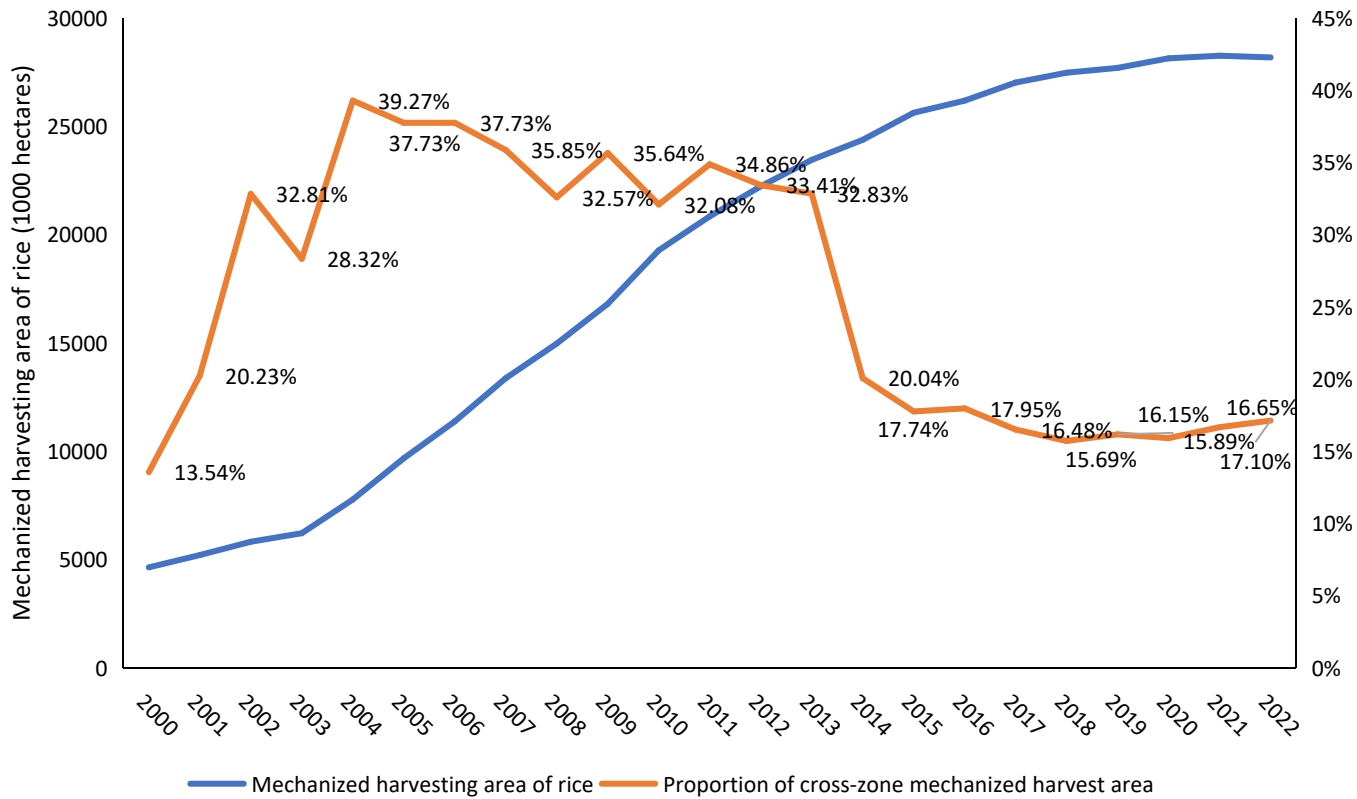




China has a vast territory. Rice can be grown in areas from south to north, with a maturity time difference of 3 months. At the same time, rice harvesters can also harvest wheat and rapeseed.

- Harvest rapeseed in Yunnan and Guangxi from March to April
- Harvest rapeseed in Hubei and Sichuan in May
- Harvest wheat in Henan, Hebei, and Shandong in June
- Harvest rice in Guangdong, Guangxi, Hunan, and Hubei from July to August
- Harvest rice in Heilongjiang in September
- Harvest rice in Jiangsu in October

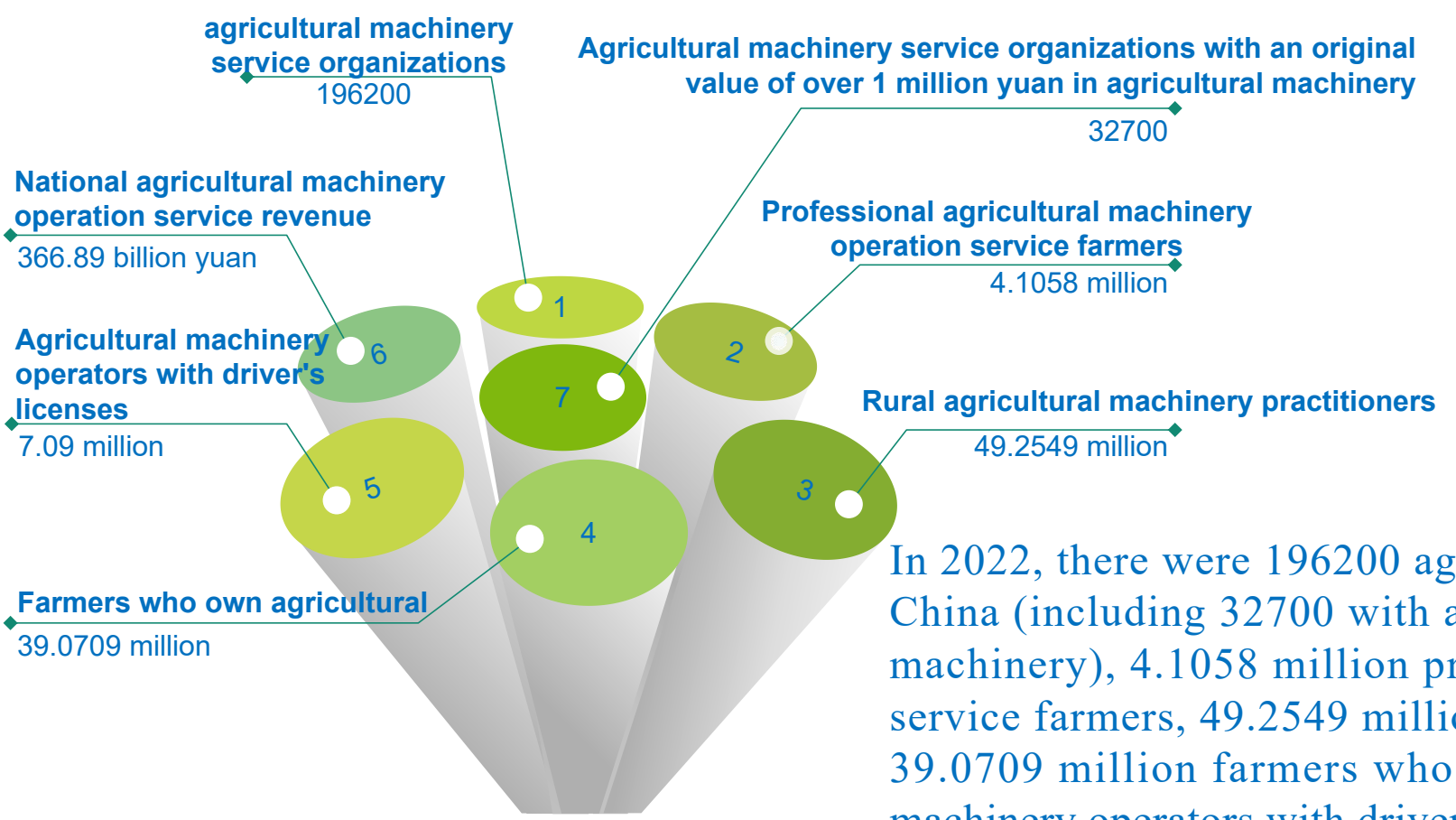




- The proportion of rice cross regional (cross county) operation area to the national mechanized rice harvesting area reached a maximum of 39.27%, and the proportion of wheat cross regional operation area to the national mechanized wheat harvesting area reached a maximum of about 70%.
- However, in recent years, with the increase in the number of harvesters, the cross regional operation area has shown a shrinking trend. However, the cross county mechanized rice harvesting operation area is still as high as 4819.21 thousand hectares.



Socialized agricultural machinery services have solved the problem of uneconomical purchase of machinery by small-scale farmers



In 2022, there were 196200 agricultural machinery service organizations in China (including 32700 with a value of over 1 million yuan in agricultural machinery), 4.1058 million professional agricultural machinery operation service farmers, 49.2549 million rural agricultural machinery practitioners, 39.0709 million farmers who own agricultural, 7.09 million agricultural machinery operators with driver's licenses, and 366.89 billion yuan in national agricultural machinery operation service revenue.



Mechanization levels of key production links of main crops in 2021 (%)

crop	ploughing	planting	harvesting	average
wheat	99.93	93.48	97.59	97.00
rice	98.82	59.11	94.43	84.12
corn	98.27	90.02	78.95	89.08
soybean	90.46	87.48	82.03	86.66
rape	87.46	38.81	50.97	59.08
potato	81.21	29.77	31.16	47.38
peanut	81.96	58.65	50.90	63.84
cotton	99.44	90.22	68.02	85.89

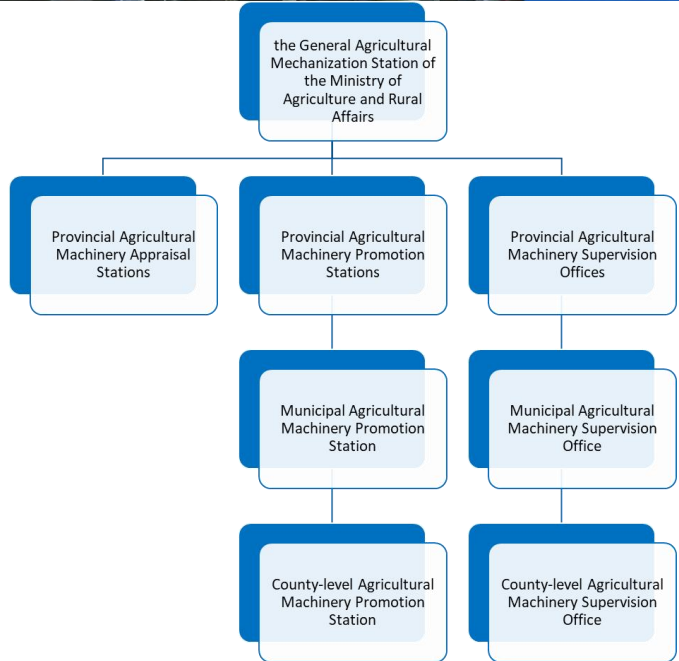
In 2021, the mechanization level of major grain, cotton, oil and sugar crops was around 90%.





04

Policy Support Experience



Promotion, Appraisal, and Supervision System Construction

□ Agricultural Machinery Appraisal Function:

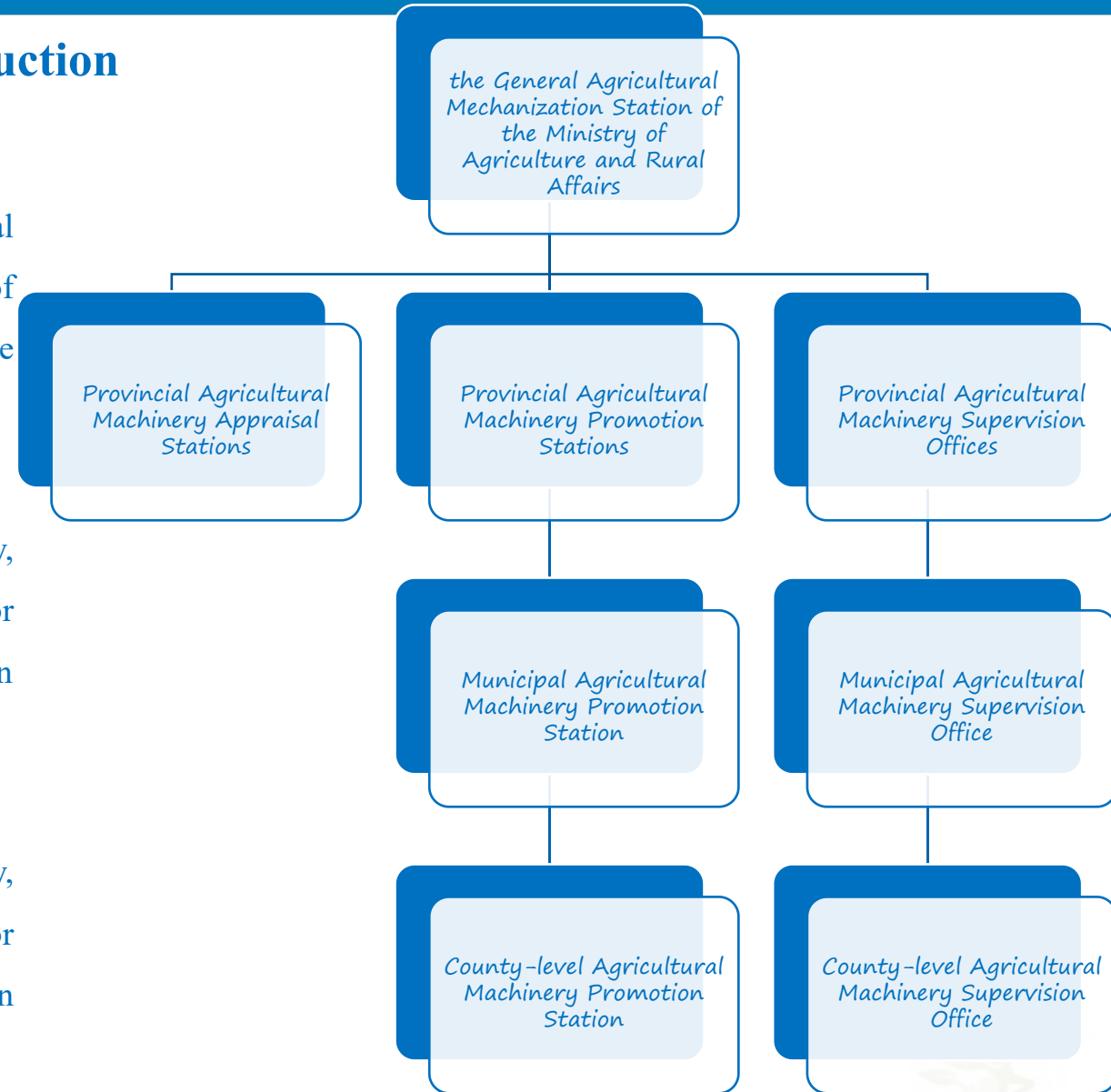
National and provincial agricultural and rural departments set up agricultural machinery appraisal institutions to be responsible for the performance appraisal of new agricultural machinery products. Only products that pass the appraisal are eligible to become agricultural machinery purchase subsidy products.

□ Agricultural Machinery Promotion Function

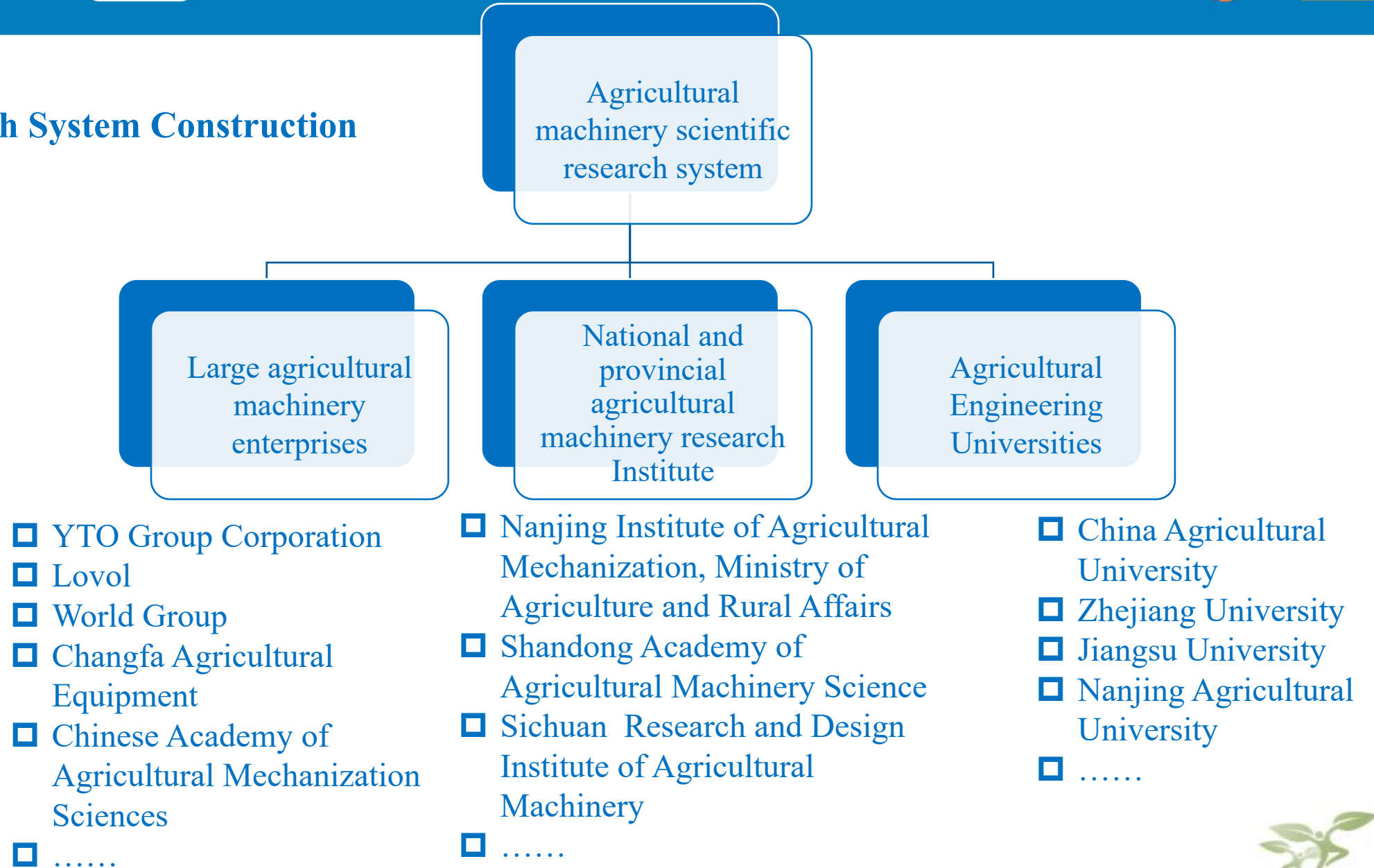
Agricultural and rural departments at all levels of the country, province, city, and county have set up agricultural machinery promotion stations, responsible for testing, demonstrating, and promoting agricultural mechanization technology within their jurisdiction.

□ Agricultural Machinery Supervision Function

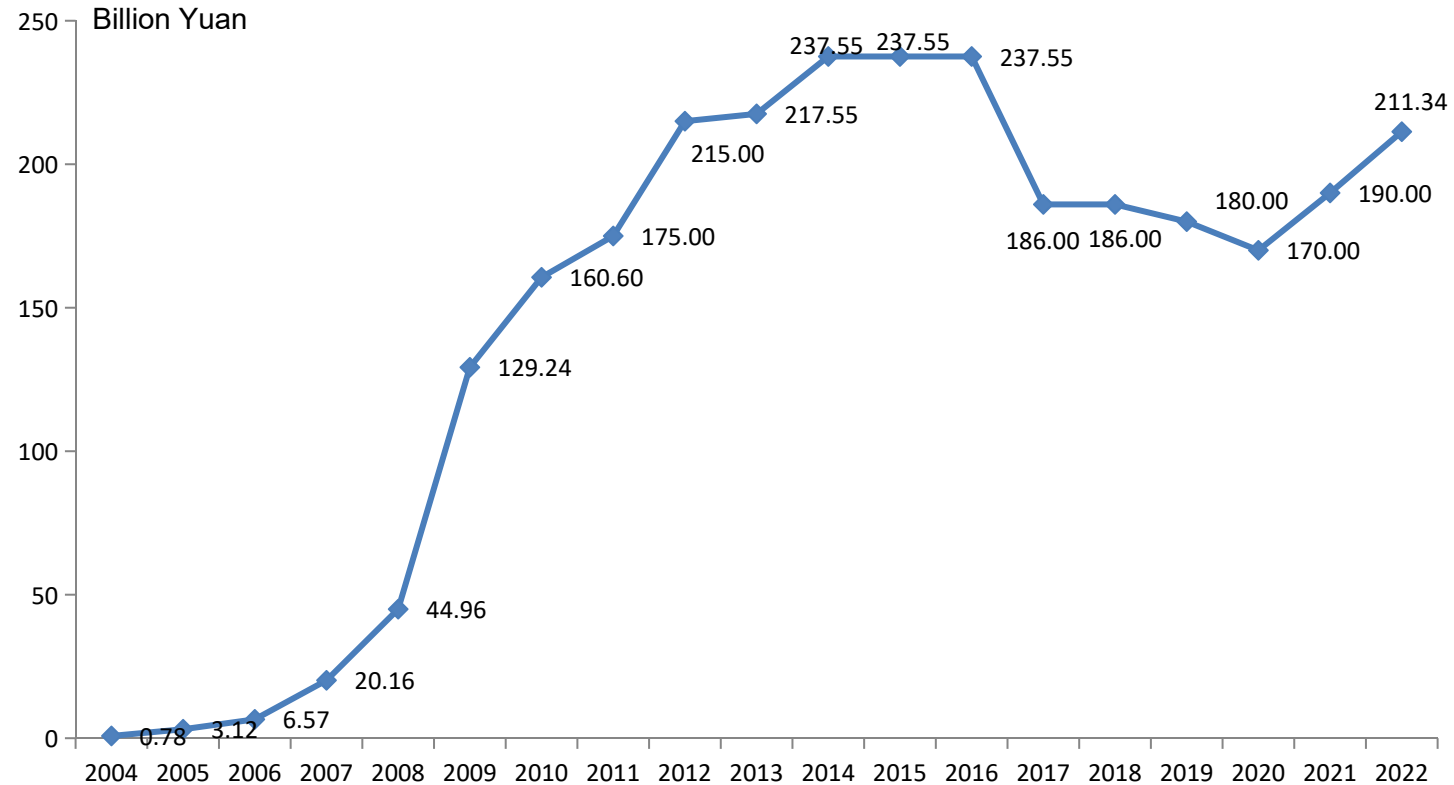
Agricultural and rural departments at all levels of the country, province, city, and county have set up agricultural machinery supervision offices, responsible for training in agricultural machinery safety operation and accident handling within their jurisdiction.



Scientific Research System Construction



Agricultural Machinery Purchase Subsidy Policy



Since 2004, China has introduced the "Law of the People's Republic of China on Promotion of Agricultural Mechanization" and implemented a subsidy policy for the purchase of agricultural machinery. The scale of subsidy funds has increased from 70 million yuan in 2004 to 21.134 billion yuan in 2022. Farmers only need to pay 70% of the actual selling price of agricultural machinery to purchase it. At the beginning, the subsidy funds were insufficient, and lots needed to be drawn. At present, it is basically inclusive, and farmers can receive subsidies if they apply.

➤ **Changes in the subsidy region**

66 counties → all agricultural and animal husbandry counties .

➤ **Changes in the scope of subsidy machine and tool**

Only 6 types of subsidized machines and tools → 15 major categories, 44 sub categories and 172 items, including tillage and land preparation machinery, planting and fertilization machinery, field management machinery, harvesting machinery, post harvest processing machinery, agricultural product preliminary processing machinery, agricultural handling machinery, drainage and irrigation machinery, animal husbandry machinery, aquatic machinery, agricultural waste utilization and treatment equipment, farmland basic construction machinery, facility agricultural equipment, power machinery, and other machinery.

➤ **Changes in the scope of subsidy recipient**

farmers and agricultural machinery service organizations directly engaged in agricultural production → all rural collective economic organizations, farmers' professional cooperative economic organizations, agricultural enterprises, and other organizations engaged in agricultural production and operation.



Cross Regional Operation Support Policy

Cross regional operations such as combine harvesters and transporting combine harvesters (including rice transplanters) are exempt from vehicle tolls.

The Ministry of Agriculture, along with six requiring all relevant departments to closely cooperate and carefully organize cross regional harvesting work until 2007.

Some agricultural and rural competent departments at the county providing cross regional operation services organized operators to carry out cross regional operations every year.



Thank You



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